

CHROME CORE 18-FM

Free machining ferritic stainless steel with a better corrosion resistance for solenoids

Distinctive feature and main attributes

The Chrome Core® 18-FM steel is a free machining ferritic stainless steel produced by CarTech®. It features a high S-addition to improve its machinability and has a high Cr-content allowing its use in still more aggressive mediums. In addition its microstructure is stabilized with an Nb addition to improving both its corrosion resistance as well as its machinability. This steel has a high resistivity reducing the eddy current losses due to AC excitation.

Use and application range

This Chrome Core® 18-FM steel is supplied in the soft magnetic annealed condition, ready for machining. The machined core parts can usually be use directly in the as machined condition, provided they have not been polluted or contaminated with free Fe-ions during machining or handling.

Chemical composition [% wt]

C	Si	Mn	P	S
max. 0.02	max. 0.90	max. 0.40	max. 0.020	max. 0.300

Cr	Mo	Ni	Nb	Fe
17.50	1.75	max. 0.20	max. 0.25	balance

Tolerances

- Bars $\varnothing < 2.00$ mm: cold down, annealed, polished, ISO h8
- Bars $\varnothing \geq 2.00$ mm: annealed, ground, polished, ISO h8

Other tolerances on request

Execution, delivery conditions, and standard sizes

Standard: round bars 3 m

- Bar ends $\varnothing > 2.00$ mm: pointed and chamfered
- Bar ends $\varnothing < 2.00$ mm: cut to length

Other executions on request

Availability

Dimensions on stock: see [product range](#)

Mechanical properties

Standard delivery condition: annealed for optimal magnetic properties
Strength UTS/Rm: 517 MPa (286 HRB)

Machining Cutting conditions

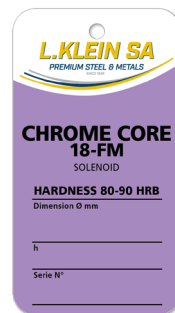
This steel grade exhibits very good machinability.

Machinability: very good

Cutting speed: $V_c \approx 45 - 60$ m/min

Cutting and coolant fluid: individual choice

- The optimal cutting conditions depend on the machine tool, the cutting tools, the chip dimensions, the lubricant-cooling fluid, as well as the tolerances and surface the roughness to be achieved.
- The chosen cutting conditions may lead to the build up of surface internal stress patterns that may negatively influence the set soft magnetic properties by increasing the coercive force.



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Hardening

- The Chrome Core 18-FM steel cannot be thermally hardened.
- This steel can be cold deformed to increase its strength, but its coercive force will also be increased. A stress relieving heat treatment can only marginally set it back.

Forming

Warm: Forging: 1'065°C

Uniform heating up to the forging temperature

- The Chrome Core 18-FM steel exhibits a strong grain growth at the forging / forming temperature. Avoid holding time before forging.

Cold: limited, not recommended.

- This steel should always be used in the soft annealed condition. The optimum soft magnetic properties can only be obtained in the soft annealed condition.

Welding

Difficult, not recommended

- The numerous complex sulfide inclusions of this Chrome Core 18-FM steel impair strongly the welding process.

Annealing

Soft anneal: 900 – 1'000°C

Intermediate anneal

Preferably: 650 – 680°C

Stress relieving

If necessary: <500°C

Mechanical properties

Condition	Rm [MPa]	RO.2 [MPa]	A [%]	Reduction of area [%]	HRB
annealed	517	345	35	61	86
stress relieved	517	345	35	61	86

Corrosion resistance

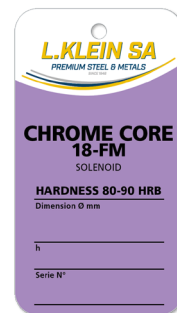
Medium / Product	Resistance	Medium / Product	Resistance
Nitric acid	moderate	Acetic acid	moderate
Natrium hydroxyde	moderate	NaCl Spray	excellent
Sea water	limited	Humidity	excellent

The corrosion resistance is always at its optimum when the surface is polished and passivized.

Polishing

This steel is not adapted to mirror polishing.

The numerous complex sulfide inclusions render the polishing significantly more difficult and decrease its efficiency and economy



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Laser marking

- The numerous complex sulfide inclusions impair the laser marking.
- The laser marking heat can influence negatively the microstructure in the "Heat Affected Zone" (HAZ) and impair its corrosion resistance. [more info](#)
- The laser marking heat can also modify the magnetic properties in the HAZ.

Pickling

The adequacy of the selected pickling process should be checked with respect to the numerous complex sulfide inclusions present in this free cutting steel.

- The complex sulfide inclusions of this steel can strongly impair the pickling process.
- Pickling before passivation is highly recommended. It should not be omitted for economic reasons only.

Passivation

The adequacy of the selected passivation process should be checked with respect to the numerous complex sulfide inclusions of this martensitic free machining grade.

- The numerous complex sulfide inclusions may significantly impair the quality of the passivation process. [more info](#)

Elementary precautions

- The simplest protection is to always keep the parts clean, polished and passivated.
- Keep the parts properly cleaned and dry (no residuals adhering on the surface).
- Use only chloride free cleaning and washing agents. [more info](#)

Physical properties

Properties	Units	Temperature [°C]				
		20	200	300	400	500
Density	g cm ⁻³	7.70				
Young modulus E	GPa	215		200	190	
Electric resistance	μΩ mm	755				
Thermal expansion	m m ⁻¹ K ⁻¹ 10 ⁻⁶	23-204°C 10.4	23-427°C 11.5	23-982°C 13.1		
Saturation	T	1.5				
Specific heat	J kg ⁻¹ K ⁻¹	460				
Remanence Br	T	0.5-0.8				
Coercive force	Oe	2.5				
Coercive force	A m ⁻¹	199				
Relative permeability μr		max. 1'500				

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